

WHAT IS CLAIMED IS:

1. A holographic recording/reproducing apparatus which either records or records and reproduces information holographically, the holographic recording/reproducing apparatus comprising:

a laser source;

a splitter unit which splits a laser beam from the laser source into a first laser beam for generating a signal beam and a second laser beam which serves as a reference beam;

a spatial light modulator which spatially modulates the first laser beam in accordance with the information to be recorded, the modulated first laser beam serving as the signal beam;

a positioning unit for positioning a holographic recording medium; and

a focusing lens system which focuses the signal beam and the reference beam onto the holographic recording medium;

wherein, in a recording process, the signal beam passes through the focusing lens system such that the central axis of the signal beam is in one of the half-regions separated along the optical axis of the focusing lens system and the reference beam passes through the focusing lens system in the other half-region which is free from the signal beam,

the signal beam and the reference beam being focused onto the holographic recording medium so that the information is recorded on the holographic recording medium.

2. A holographic recording/reproducing apparatus according to Claim 1, wherein the holographic recording medium is a transmissive holographic recording medium,

wherein the focusing lens system is a first lens system and the holographic recording/reproducing apparatus further comprises a second lens system which faces the first lens system across the positioning unit,

wherein, in the recording process, the signal beam passes through the focusing lens system such that the central axis of the signal beam is in one of the half-regions separated along the optical axis of the focusing lens system and the reference beam passes through the focusing lens system in the other half-region which is free from the signal beam, the signal beam and the reference beam being focused onto the holographic recording medium so that the information is recorded on the transmissive holographic recording medium, and

wherein, in a reproduction process of reproducing the information recorded on the holographic recording medium, the first laser beam is blocked and the reference beam is directed onto the holographic recording medium at the same

incident position and incident angle as those of the reference beam in the recording process so that a signal reproduction beam corresponding to the signal beam is generated in accordance with the information recorded on the holographic recording medium, the signal reproduction beam being guided through the second lens system such that the signal reproduction beam is point symmetric to the signal beam in the recording process across the holographic recording medium.

3. A holographic recording/reproducing apparatus according to Claim 1, wherein the holographic recording medium has a reflective film,

wherein, in the recording process, the signal beam passes through the focusing lens system such that the central axis of the signal beam is in one of the half-regions separated along the optical axis of the focusing lens system and the reference beam passes through the focusing lens system in the other half-region which is free from the signal beam, the signal beam and the reference beam being focused onto the holographic recording medium so that the information is recorded on the holographic recording medium having the reflective film, and

wherein, in a reproduction process of reproducing the information recorded on the holographic recording medium,

the first laser beam is blocked and the reference beam is directed onto the holographic recording medium at the same incident position and incident angle as those of the reference beam in the recording process so that a signal reproduction beam corresponding to the signal beam is generated in accordance with the information recorded on the holographic recording medium, the signal reproduction beam being guided through the focusing lens system such that the signal reproduction beam is symmetric to the signal beam in the recording process about the optical axis of the focusing lens system.

4. A holographic recording/reproducing apparatus according to one of Claims 1, 2, and 3, further comprising an optical component including a quarter-wave plate and a polarization beam splitter which are integrated with each other, the optical component being disposed on an optical path between the spatial light modulator and the focusing lens system and the quarter-wave plate having a reflective surface on a part of the outer face thereof,

wherein the first and the second laser beams split by the splitter unit are guided into the optical component and are reflected by the polarization beam splitter,

wherein the first laser beam reflected by the polarization beam splitter passes through the quarter-wave

plate toward the spatial light modulator, is modulated by the spatial light modulator, passes through the quarter-wave plate and the polarization beam splitter, and is incident on the focusing lens system, and

wherein the second laser beam reflected by the polarization beam filter passes through the quarter-wave plate, is reflected by the reflective surface, passes through the quarter-wave plate and the polarization beam splitter, and is incident on the focusing lens system.

5. A holographic recording/reproducing apparatus according to Claim 3, further comprising an optical component including first and second quarter-wave plates and a polarization beam splitter which are integrated with one another such that the first and second quarter-wave plates face each other across the polarization beam splitter, the optical component being disposed on an optical path between the spatial light modulator and the focusing lens system and the first quarter-wave plate having a reflective surface on a part of the outer face thereof,

wherein the first and the second laser beams split by the splitter unit are guided into the optical component and are reflected by the polarization beam splitter,

wherein the first laser beam reflected by the polarization beam splitter passes through the first quarter-

wave plate toward the spatial light modulator, is modulated by the spatial light modulator, passes through the first quarter-wave plate, the polarization beam splitter, and the second quarter-wave plate, and is incident on the focusing lens system, and

wherein the second laser beam reflected the polarization beam filter passes through the first quarter-wave plate, is reflected by the reflective surface, passes through the first quarter-wave plate, the polarization beam splitter, and the second quarter-wave plate, and is incident on the lens system, and

wherein the signal reproduction beam from the holographic recording medium is guided through the second quarter-wave plate into the polarization beam splitter, is reflected by the polarization beam splitter in the direction opposite to that in which the first laser beam is guided into the polarization beam splitter in the recording process, and is guided into a sensor for the signal reproduction beam.

6. A holographic recording/reproducing apparatus according to one of Claims 1, 2, 3, 4, and 5, wherein the spatial light modulator and the holographic recording medium are at the front focal point and the rear focal point, respectively, of the focusing lens system, and

wherein the divergent angle of the reference beam

incident on the focusing lens system is set to an angle corresponding to the divergent angle of the signal beam on the focusing lens for a single pixel.

7. A holographic recording/reproducing apparatus according to one of Claims 1, 2, 3, 4, 5, and 6, wherein the spatial light modulator has a diffraction grating structure including a plurality of reflective ribbons and performs phase modulation of the first laser beam which reaches the reflective ribbons in accordance with the positions of the reflective ribbons.

8. A holographic recording/reproducing apparatus according to one of Claims 1, 2, 3, 4, 5, 6, and 7, wherein angular-multiplexed recording is performed by moving the reference beam in the direction perpendicular to the optical axis of the focusing lens system while the reference beam is maintained parallel to the optical axis of the focusing lens system.

9. A reproducing apparatus for holographically recorded information comprising:

a laser source;

a positioning unit for positioning a transmissive holographic recording medium on which the information is

recorded;

a first lens system which is a focusing lens system disposed between the positioning unit and the laser source; and

a second lens system which faces the first lens system across the holographic recording medium,

wherein a reference beam from the laser source is guided through the first lens system in one of the half-regions separated along the optical axis of the first lens system and is focused onto the holographic recording medium at the same incident position and incident angle as those in the process of recording the information on the holographic recording medium, and a signal reproduction beam from the holographic recording medium is guided through the second lens system in the other half-region.

10. A reproducing apparatus for holographically recorded information comprising:

a laser source;

a positioning unit for positioning a holographic recording medium which has a reflective film and on which the information is recorded; and

a lens system disposed between the positioning unit and the laser source,

wherein a reference beam from the laser source is



guided through the lens system in one of the half-regions separated along the optical axis of the lens system and is focused onto the holographic recording medium at the same incident position and incident angle as those in the process of recording the information on the holographic recording medium, and a signal reproduction beam from the holographic recording medium is guided through the lens system in the other half-region.